otropically) in darkness, and give a very characteristic geotropic reaction, having abundant statolith starch. *P. epiphylla* generally does not grow in darkness. Neither these two nor *Lophocolea bidentata* are geotropic in light. The behavior in darkness of *P. epiphylla*, the two species of Lophocolea, and the sporogone of Aneura must be considered as purposeless.

The researches appear to strengthen the statolith theory of geotropic perception.—C. R. B.

Photosynthesis.—USHER and PRIESTLY, having shown in a previous paper[15] that CO_2 may be decomposed in plants independently of enzymic or "vital" activity provided the products (H_2O_2 and H·COH) are removed, have now devised an arrangement by which photolysis of CO_2 can be produced *in vitro*.[16] By covering gelatin plates, or even water, with a very thin uniform layer of chlorophyll deposited from solution, and placing the glass plate or the shallow dish of water carrying the film in a vessel with CO_2 and illuminating it, they found formaldehyde produced and were able to recover identifiable quantities. By making up the gelatin with an aqueous solution of a catalase, the hydrogen peroxid also produced was decomposed with the evolution of O_2, 2^{cc} being obtained in one case. The chlorophyll was gradually bleached, in harmony with the view that it acts as a sensitizer and is destroyed in the process of photolysis. Synthesis of H·COH into carbohydrate was found in the earlier paper to be dependent on the healthy condition of the protoplast, and feeding experiments have already shown that H·COH when supplied in very dilute form can be condensed by green plants if illuminated. The authors painted the white petals of *Saxifraga Wallacei* with chlorophyll, and floated them on water charged with CO_2 in light. In the course of a day they were found to contain starch. Thus they secured photosynthesis by a different (though inefficient) arrangement of the mechanism of a green leaf.

Further study was made of photolysis of CO_2 in the presence of uranium salts. They have direct evidence of the production of formic acid (which also is produced under some conditions in the plant as an intermediate product in the reduction of CO_2), but they were unable to isolate and identify formaldehyde.

These papers record a most important step in solving the problems of photosynthesis.—C. R. B.

Vascular anatomy of cycads.—Two years ago MATTE published his thesis on the vascular anatomy of the cycads,[17] in which he presented in great detail, with copious illustrations, the vascular anatomy of the leaves and flowers in representative species of all the nine genera; and of the seedlings of *Dioon edule*, *Cycas*

[15] USHER, F. L., and PRIESTLY, J. H., A study of the mechanism of carbon assimilation in green plants. Proc. Roy. Soc. London B. **77**:369–376. 1905.

[16] ——The mechanism of carbon assimilation in green plants: the photolytic decomposition of carbon dioxid *in vitro*. *Idem* **78**:318–327. 1906.

[17] MATTE, H., Recherches sur l'appareil libero-ligneux des Cycadées. pp. 233. *pls. 16. figs. 264.* 1904.

siamensis, and *Encephalartos Barteri*. He lays special stress on the strands of the foliar organs, his unit of primary importance in relation to phylogeny being what he calls the *meriphyte*, the vascular axis of the stem being of secondary importance. Among other conclusions in reference to the strands of the leaves, he states (1) that the course of the vascular strands sometimes presents great complexities, and (2) that the classic Ω of the foliar arc, although usual, is not general, referring particularly to Bowenia. A later paper[18] deals with the structure of the meriphyte of *Bowenia spectabilis*, and attempts to prove that the complex arrangement of the foliar strands even in this form can be reduced to the typical Ω.—R. THIESSEN.

In an earlier paper MATTE[19] noted in certain ovulate sporophylls of Ceratozamia the occurrence of three or more vascular strands near the abaxial surface of the sporophyll, in addition to the row of strands that usually appears in transverse section. These accessory strands showed reversed orientation, the xylem being on the abaxial side; and MATTE regards this as an evidence of the union of two sporophylls along their edges.—CHARLES J. CHAMBERLAIN.

Problems of nutrition.—ARTARI published in 1904 an account of the influence of the different concentrations of glucose and saccharose upon the development of *Stichococcus bacillaris* and certain lichen-algae. This he now supplements[20] by investigating the effect of different concentrations of each component of the nutritive solutions upon the amount and energy of multiplication in *Stichococcus Chlorella* (a new physiological species) and the algae from *Xanthoria parietina*.

The concentration of NH_4NO_3, which was the source of N, has no effect on Chlorella below 0.5 per cent., and on Stichococcus below 1 per cent.; but higher concentrations retard development, and suggest that the salt acts also in another way than by its osmotic pressure. The nutritive value of various sources of N varies according as glucose is present or absent. Glucose itself exercises an observable effect even at 0.005 per cent., and acts best between 0.5 and 2 per cent. The limiting concentration of monosaccharides, varying more or less with different algae, seems to be related to molecular weight, since it is about equal in monosaccharides (glucose, galactose, and fructose), and approximately double this limit in disaccharides (saccharose and lactose), which also agree together. Many other details, not easily related, are also recorded. A few observations upon the effect of concentration upon the form and size of cells are given incidentally; the author seems not to know of LIVINGSTON'S papers on this subject. —C. R. B.

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[18] MATTE, H., Compléments à la structure mériphytaire du *Bowenia spectabilis*. Compt. Rend. Acad. Sci. Paris, 409–416. 1905.

[19] MATTE, H., Une anomalie de structure dans l'écaille ovulifère de *Ceratozamia mexicana*. Bull. Soc. Linn. Normandie V. **7**:52–54. 1903.

[20] ARTARI, A., Der Einfluss der Konzentrationen der Nährlösungen auf die Entwicklung einiger grüner Algen. II. Jahrb. Wiss. Bot. **43**:177–214. 1906.